We need more coherence in the simulation task force. We have several groups doing simulations and sometimes you really get lost in: different deep traps models, different simulation tools, different models for basic Si properties, different geometries, different data to which everything is fit ….

I think the steps to bring more coherence are the following:

a) **cross calibrate the simulation tools in a most basic cell (large p+-n pad detector with only shallow dopants) in the similar way we did for our "custom made" simulation packages (https://indico.cern.ch/event/456679/contributions/1126330/). Not really ambitious, but showing that the drift times and induced current pulses calculated with TCAD and Silvaco agree to certain precision (we need both in order not to blindly trust one!). It may be a starting point to select suitable parametrizations for : mobility, impact ionization. It is essential that the induced currents agree, not only the charge, leakage, CV which is mostly shown. Note the choice of boundary conditions at the surface should be the same for all attempts. Do the temperature dependence study.**

b) Test signal calculation also for multi-electrode system. Try to simulate as single infinitely long strip - 2D problem (e.g. atlas geometry pitch-width-thickness = 80-20-300 um) and see what effects it has – double, quadruple the basic cell … and see if Ramo's theorem is correctly accounted for. Maybe a comparison with "custom made" tools should be done…

c) Try to introduce a single level in a band-gap and calculate its contribution to the current and space charge. This is crucial to do – a single level 1D problem should be easy to implement and the data between different tools should agree. See if this matches expectations.

d) **With a,b,c fulfilled a cross-calibration with two/three deep levels should be done in the same way as for c).**

I know people have done these steps before , but we should have a kind of official reference results. So, a document where a standard set of parameters is defined and what should come out the simulations when one uses this set. This is the starting point for every group involved in simulations to “calibrate” their tools. Once we have our anchor set then we can start looking where the differences come from, what is their origin and why …

I think only after a,b,c,d comes the interesting part of:

- including P ad B removal
- including more traps
- varying the parameters of traps
- modifying mobility and impact ionization models for irradiated silicon
- study of surface effects
- exploration of convergence/no-convergence of simulation tools
- simplification of simulations (separate calculation of fields and drift currents) and making them Monte Carlo ready
- setting up the “ultimate“ model describing irradiated devices with different particles.
- electronics